

"VILLAGE WATER, HEALTH AND A POTENTIAL ROLE FOR
PRIMARY HEALTH CARE"

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by

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Water, its quality and availability has a bearing on many of the most important diseases constraining development in the third world today. Water is a pre-requisite to the spread of Schistosomiasis by means of the intermediate snail host; it is also essential for the growth of Simulium, the black fly bearing onchocerciasis; it is also the breeding ground of the Anopholes the carrier of malaria. One cannot over-stress the importance of these water-related diseases and their eradication to development. It would be unrealistic, if not impossible, to give adequate coverage to all diseases which are affected by water and therefore I intend to narrow the scope of this short talk and provide practical foci for group discussions to follow.

This meeting comes in the wake of the United Nations Conference on Water held in Argentina last week at which a great deal was said about water supplies and the need - if not human right - for safe reliable water within reasonable access to all. The UN Water Conference was preceeded by HABITAT out of which came the recommendation for clean water for all by 1990. The justification for setting a target requiring \$30 billion per year over the next fourteen years hinges largely on health, the prevalence of enteric infections and other water-related diseases in developing countries and the ability of improved accessibility of safe water supplies to combat these diseases. In the eyes of the so-called 'developed society', clean water is seen as a pre-requisite for comfortable healthy living. This is feasible because acquiring water takes up only a very small percentage of the American or European income, and the thought of a cholera or typhoid epidemic running through New York

or London via the water supplies is truly horrific. Consequently, there is a serious danger that we the 'international water engineers' will transfer such concepts and practices to developing regions where such diseases as cholera and typhoid are common place, indeed endemic; where their normal transmission routes have little to do with the water supply, and where the people simply cannot afford to pay for water supplies. These regions tend to accept external help and with it externally determined development priorities which may have little or nothing to do with their real needs.

On the other hand, there are areas which are in dire need of improved water supplies, where during the dry season the woman must spend a good portion of the day walking five or even ten kilometers to scrape water from a muddy hole. These water-scarce areas justifiably demand first attention but this justification is based on labour and time-savings and not on health. There is too great a temptation for the politician, the UN delegate, the aid agency employee, the international consultant and water engineer to simplify and generalize the solution using water as a panacea, and climb on the next international bandwagon with such catchy phrases as "Clean Water for All":

It's just not that simple. If limited finance and even scarcer human resources are to be effectively spent on improving health, we must recognize that water delivery is only one element in a complex matrix of activities which must go on if it is to have any significant effect on health at all. The question is not how many water supplies can be installed over a given period of time, but why and how they are implemented, to what effect, and most important of all, at what opportunity costs.

I want, at this juncture, to make three specific points and later elucidate:

1. The first is that those tropical diseases which may be termed water-borne or water-washed may well not be affected by improvements in water supply in many of the communities at which the "water movement" is aimed.
2. Secondly, that water is a political animal which has a tendency to be used for political gain at cost to the recipient. There is a dangerous tendency to take a purely technical approach in the delivery of water; to merely install equipment without adequate education and maintenance backup and omit the much needed integrated community development component.
3. Finally (accepting the fact that water, appropriately delivered and properly used, is an essential component of the health package) we are ignoring the greatest source of potential manpower capable of reaching the otherwise inaccessible smaller communities - the emerging primary health care programmes.

Water and the Water-washed Diseases

Bradley (1977) and Feachem (1975) have classified water-related diseases by the manner in which water affects them. Thus, typhoid and cholera are said to be water-borne in that faecally contaminated water supplies have often been claimed to be the spreading mechanism. The water-washed diseases which are said to be affected by increased quantity of water used in the home include bacillary dysentery and other diarrhoeal infections which can be water-borne but are more likely to be transmitted directly along the faecal-oral route. Many skin and eye diseases are affected by water use practices and include scabies, skin sepsis, fungal infections and trachoma. These are not water-borne nor are the water-washed infections which rely on fleas, ticks, lice and mites for transmission. The water-washed diseases are likely to respond to increased quantity of water but not be affected by its quality. The World Bank conducted a survey of the literature on the health impacts of water supplies which is summarized by Saunders and Warford (1976) in which

it is concluded that all other factors being equal, the highest diarrhoeal infection rates are to be found in households which are furthest away from their water sources. Likewise, studies pertaining to skin diseases show that skin disease prevalence is inversely related to the quantity of water available for use. Thus, the availability, the quantity and the way in which the increased water supply is used is more important to its effect in reducing incidence rates of the water-washed diseases than is its quality.

The mere delivery of water into a village by pipeline and standpipes or more commonly by the provision of a tubewell and hand-pump does not guarantee an increased usage of water. Westman and Hedkvist (1972) found in their review of the Tanzanian Water Programme that the amount carried from traditional sources was quite small and increased only slightly with the provision of piped water. Similar conclusions were drawn by Feachem et al (1977) in their study of consumption patterns in Lesotho. A distinction should be drawn here between water supply programmes bringing piped water into the home and those which bring it to central points in the village. House connection supplies are associated with increased consumption and improved use practices but hand-pumps and stand-pipes tend not to be. Unfortunately piped water systems to the individual household are more expensive and inherently give rise to the need for additional construction of drainage facilities to remove the spent water from the household and community. With perhaps the exception of Latin America, the main thrust of water supply programmes focuses on stand-pipe delivery and hand-pumps.

We can see then that major pitfalls are likely to be encountered in assuming that the water-washed diseases such as bacillary dysentery, salmonellosis, paratyphoid fevers, ascariasis, skin sepsis, trachoma,

and etc. are going to be significantly reduced by merely installing central clean water sources in the village. Yet most of the water delivery programmes make this assumption and remain limited to the objective of only providing water.

What then about the quality of water: major emphasis is being placed on not only providing water but ensuring that it is "clean". It would of course be desirable, however unrealistic, to be able to achieve WHO suggested water quality standards in villages - but under what justification? There are cases where chemical contaminants (for example excessive fluorides, arsenic and nitrates) which are of definite danger to public health but such contaminants are generally site specific. Justification for insisting on high standards of water quality is most often based on the fact that the water-borne diseases are indeed transmitted between and within rural communities via their drinking water.

Thousands upon thousands of tubewells and hand-pumps are being installed in cholera endemic areas of Bangladesh where water is plentiful but "clean" water is scarce. Justification for this enormous undertaking is based on the assumption that provision of clean water will indeed reduce the cholera incidence rates. Levine et al (1976) have reported on their studies on the cholera/clean water relationship in Bangladesh. They came to the unexpected conclusion that cholera and diarrhoeal incidence rates amongst persons using water from the tubewells were no less than amongst those using traditional unimproved sources. On the other hand, positive correlation was found between education and reduced cholera and diarrhoea levels which points to the conclusion that these diseases, endemic to the area, were not primarily water-borne.

Recent studies in typhoid endemic areas of Lesotho (Feachem, et al, 1977) compared typhoid incidence rates in villages which had and used improved piped water supplies to those which used only traditional sources. No difference in either the prevalence or the seasonality of typhoid or diarrhoea was detected between villages with or without piped water supplies. Yet justification for ~~greater~~ investments in water supply installations are based on the premise that improving the quality and supply of water will reduce typhoid levels.

These empirical studies point to the conclusion that transmission of what have been assumed water-borne diseases in rural communities of tropical countries may in many (if not most) cases not primarily be via the water supply but are more likely to rely on the more direct faecal-oral or the faecal-food-oral routes. In recognition, cholera and typhoid should perhaps be re-classified as water-washed diseases. As in the case of the other water-washed diseases, the installation of a central clean water source in the rural community would likely have no impact on health unless improvements in water use practices, excreta disposal and hygiene were also achieved.

If we are to speak of the importance of water supply, proper excreta disposal and hygiene improvements to health and the need to implement such activities in rural areas of developing countries, they must be viewed together as components of a "sanitation package". If each component is left to be implemented separately, much of the health benefits are seriously constrained, if not totally lost.

Delivering Water Supplies to the Rural Community

Rural water supplies have recently become the focus of international attention. The idea of clean water, plentifully available in an otherwise destitute rural village is highly attractive to the politician. It also appeals to the international bank, UN agencies and aid organizations who are now searching for ways to direct their efforts towards rural development. As a result, rural water has risen from a point of relative obscurity and shoe-string budgets to a pinnacle of international publicity culminating in one of the largest international conferences which will likely result in large sums of money being channelled to programmes which are ill-equipped to cope with them.

Despite their good intentions, international aid organizations are seriously constrained by their lack of contact with rural peoples of the developing countries; their very nature has kept them confined to a "top down" approach and separated from the very peoples they now wish to assist. They are in the main limited to participating through financial and technical assistance and are thus highly technology oriented.

The result of all this will likely be the release of large sums of aid funds to provide inducement for a more rapid expansion of rural water delivery programmes in developing countries. Here, money implies technology and technical solutions will be sought and pressed into service to meet the construction targets set by the funds being made available. Unfortunately there is a severe shortage of experienced manpower capable of implementing effective rural water delivery programmes in both the donor agencies and recipient countries alike. This, coupled with the

inherent difficulty of successfully introducing any kind of technology to the rural community will likely result in gross errors and financial resources being wasted at high opportunity cost. Worse still, as experience in Africa has shown, the villager will become disillusioned and skeptical, even resistant to future efforts by his urban counterpart to improve his lot.

Examples of such failures are not difficult to find - they exist in most African countries where lack of maintenance and repair capabilities in rural areas is exasperated by the import of inappropriate well drilling equipment and several varieties of hand-pumps more suited to the back garden of the Western farmer than the centre of a drought-prone populous village. Henry (1976) gives an example where in one Asian country about 50,000 village wells have been drilled in hard rock at a cost of \$40 million in water-scarce regions; an estimated 80 per cent of these wells are no longer producing water. The problem is not only technical, the pumps are installed with insufficient involvement with the village - the site for locating the pump is selected by the engineer not the village leader. The villager views the pump as belonging to the government department which installed it and therefore not the responsibility of the villagers themselves to look after it.

We can, for the purposes of this discussion, and at the risk of over-simplification, broadly classify rural communities into three groups according to their accessibility to water and the approach which may be taken to improve the supply of water.

In the first group are the rural villages without adequate access to a year-round supply, whether it is contaminated or not. These are termed

the water-scarce villages where during the dry season water must be carried over a distance of several kilometers. Water is badly needed in what-ever quantity and quality. Benefits to be accrued are largely in terms of labour and time savings, not health. These communities clearly view accessibility to water as being their highest priority and should be dealt with first.

The second type of community does have perennial alternative water sources within reasonable access. Given free choice, they would likely choose other development priorities than improving their existing water sources. Not surprisingly the vast majority of rural communities fall in this category. Consider the village which has for centuries collected water from a nearby stream during the wet season and when it dries up draws water from deep dug wells, also within easy access. As far as international standards are concerned, all these sources of water are heavily contaminated - but life goes on regardless. Then clean water is brought to the village, a hand-pump is installed. It is accepted and used but the women and children collect the same amount of water as they did before and in the same containers. Daily routine doesn't change and the buckets and household containers are just as contaminated as they were before. Faecal contamination of household utensils, clothes, hands and food persists; the smaller children continue to defecate indiscriminately around the household. The nearby stream and wells are also used for water supply as they have always been as far as one can remember. Then one day a metal pin on the pump breaks and it falls idle. There is no perceived need to request its repair, even if there were, who would the villagers ask, and what would be the response? No one is noticeably worse off by the pump's introduction and failure. The village is unaffected;

the engineer and his administrator can chalk up yet another water supply installed - but at what cost? The price paid is in the wastage of scarce manpower and financial resources, the misconception that rural development has been enhanced and in the skepticism engendered and confirmed in the villagers perception of the government's ineffectual "assistance".

The third grouping encompasses the rural town which may or may not be water-scarce but which is large and organized enough to be directly accessible to the central government water supply implementing agency. Here the top-down approach can be taken. Piped water to the household is normally the objective, a committee or municipal department can be made directly responsible to ensure continued maintenance of the system and collect water rates to pay for maintenance and extension costs. Here health benefits are likely to accrue, water is being made plentifully available inside the home. Water use practices will change and sanitary education is relatively easy to effect. The rural towns are and will continue to be serviced first. They are attractive to outside funds in terms of accessibility, capacity for repayment of loans, potential health benefits and ease of centrally coordinated management.

The water-scarce village will also be given priority but there exists no capacity to maintain the tubewell or piped water system, the villages are most often over a day's journey over rough roads away from the central point of administration and supplies. Here the top-down approach is highly susceptible to failure. Examples of clogged well screens, broken hand-pumps, seized diesel engines, burst pipes, and defunct standpipe taps are commonplace throughout the country where the top-down approach is taken.

Up to this point I have been somewhat critical, even cynical in

highlighting the pitfalls of implementing water and sanitation programmes in rural areas. There are some success stories; in Malawi for example, village participation was the key to success in bringing piped water to over 150,000 villagers falling in the water-scarce category at a cost of less than \$3/capita. The engineer, Lindsay Robertson, backed by the Department of Community Development and Social Welfare, began on a small scale by physically demonstrating that one could transport water through pipes from a perennial mountain stream several kilometers away. Convinced, the villagers participated by digging all the trenches, layed the pipes and constructed the concrete apron and soak-away pit around the village taps. This initial demonstration mushroomed, soon the demand for piped water outstripped the capability to deliver. The bare foot engineer concept was introduced in the form of rural water technicians for the ever-expanding activity. Three week technical courses are conducted under tent for carefully selected technically oriented men with limited education, this training also includes a major community development component. Initially the piped water projects were small in size making use of demonstrations and examples so that the villagers knew exactly what they were getting into. Now, large public meetings are held to ensure that any commitments being made are fully understood and acknowledged by all. More importantly, this approach involves the people not only in construction but in decision-making roles so that they are, to a large extent, responsible for the success of the system and willing to take on its continued maintenance and repair.

The community development approach taken in Malawi took a decade of patience, understanding and hard work to achieve. It is a clear cut example of success; unfortunately the urgency with which international funds will have to be spent, the commercial drive of equipment manufacturers

and the inexperience of agencies in dealing with rural peoples are likely to result in no heed being taken.

Primary Health Care and Rural Water/Sanitation Delivery

It is the need for the bottom-up approach in rural villages which poses the greatest barrier to the national water authority's effectiveness. Such authorities are typically staffed by engineers, economists and administrators not by sociologists and community development officers. Inherently, they operate through the medium of technology and by past experience they are urban systems oriented. With few exceptions, recent experience has revealed their incapacity to reach and interact effectively with the rural village. Some other mechanism capable of operating at the village level is needed. In principle, community development departments are well suited to the task of ensuring village participation and commitment but in many countries they are relatively ineffectual and lack the technical capability required to design and construct water and sanitation systems, nor are they health oriented. I would like now to take up the role of primary health care programmes in improving rural water supply and sanitation in rural areas.

We are well aware of the shortcomings of many conventional health services of developing countries in which emphasis has been on creating sophisticated centralized medical services, the training of highly competent qualified medical personnel and an orientation towards curative medicine practices. The outcome is a rigid and over-centralized urban-oriented administrative superstructure which although purporting to serve the rural poor, lacks the necessary ability to reach out to them.

In attempting to meet the challenge, a few countries have undertaken

commitments to the rural poor and given real priority to rural health care services. These include China, Cuba, Tanzania and Vietnam. Each system of primary health care differs in response to the varying needs and conditions of the community and country. There are some common characteristics, however, some of which would be of use in rural water supply and sanitation programmes. Primary health care activities may be centrally coordinated but they are locally controlled. Action takes place at the village level, the chief functionaries remain and work in the community, are responsible to it and preferably have been brought up as one of its members. Thus a source of education and information is always available to the village. Any technology introduced as part of the primary health care programme can be maintained and is regarded as belonging to the community it serves.

In Vietnam, rural health services began in 1945 with a total of 51 physicians, 152 assistant physicians, 21 pharmacists, 1,227 nurses and 215 midwives. From its inception, emphasis was on preventative measures. By 1967 the secondary medical schools had trained 8,000 assistant health workers (assistant doctors and assistant pharmacists) and 20,000 auxiliary personnel (nurses, midwives and student nurses), not counting a still greater number of health workers and hygiene activists who had passed through short courses (McMichael, 1976). From the beginning it was an uphill battle:

"To make physicians trained in the old faculties leave their consulting rooms or hospitals, become interested in digging wells and installing septic tanks, in a word, in the prevention of diseases, is contrary to their deep-rooted habits..... To give an injection of an antibiotic, which cures almost miraculously, is a gesture much more congenial than to lift up the lid of a septic tank. To practice a complicated surgical operation with costly ultra-modern apparatus imported from abroad results in more prestige than to lecture on hygiene in villages or to help village health workers complete their medical education." (Tham Ngoc Thach, 1955, McMichael, 1976).

Of all the public health measures designed and put into use in Vietnam, the double septic tank (double vault latrine) has perhaps been the single most important factor in preventing disease. This unit permits anaerobic composting of refuse and excreta over several months before it is used as an innocuous humus fertilizer. The double tank is used to combat the "faecal peril" seen as being a focal point in the spread of disease. Model tanks were built to convince the peasants of their value before generalizing their use. This was backed by educational programmes effected through the basic health network aimed at changing unhygienic habits and improving sanitation. Water supply had previously come from open and severely polluted ponds. Deep tubewells and hand-pumps could not be afforded so during the dry season wells were hand dug six meters deep, the sides being kept up by concrete pipe rings lowered into the well. At present there are on the average one double tank, one well and one bathroom respectively for 1.4, 3.3 and 4.7 households. The key to this success has been the ability of health services to work from within the community

"as in all our public health work, it is by patient persuasion that the new overcomes the old, step by step in a slow process of assimilation." (McMichael, 1976).

It is often claimed that such achievements are not possible in many of the developing countries which do not have the Vietnamese or Chinese political infrastructure, yet primary health programmes are being initiated in many such countries, these represent an enormously valuable potential resource for improving water supplies, sanitation and hygiene levels in the future. There are some fundamental problems however.

Karlin (1977) presents a survey of 180 such low-cost health delivery systems which are serving an estimated 150 million people. The survey was limited by its reliance on a single mailed questionnaire and all which

that implies. However there are some outstanding conclusions we can draw with respect to preventative measures being taken through water supply and sanitation. In trying to identify common project bottlenecks, each project was asked which of a given list of deficiencies and problems interfered with project operations. Responses listed in order of an "interference score" are given in the following table:

Inadequate arrangements for disposal of human wastes	- 96
Too few health workers (other than physicians)	- 96
Low literacy level	- 90
Acceptance of superstitions	- 88
Inadequate or irregular supply of safe drinking water	- 78
Too few physicians	- 78
Inadequate funds to buy needed resources	- 77
<u>etc</u>	

Thus excreta disposal and water supply are seen to rate high on the list of important bottlenecks yet when the data was analyzed for areas of project activity health education, maternal and child health (MCH), treatment of the ill, nutrition, immunization and training were most common while fewer than four out of ten projects were attempting to improve environmental sanitation.

Why, with recognition given to the importance of inadequate excreta disposal practices and water supplies isn't more being done about them. Looking at the kinds of personnel engaged in the projects gives some clues: only 23% of projects had a sanitary or health inspector on staff; training programmes to upgrade skills in water supply and excreta disposal are not even mentioned. Thus project priorities and activities reflected personnel expertise but not perceived problems and needs.

Primary health care programmes have been shown capable of reaching the village with basic environmental improvements. Unfortunately relatively few countries have thus far benefitted in this way. In other areas many

low-cost health services projects are operating at a small scale and will serve as models on which national health care programmes will be based. Few are engaged in improving excreta disposal and water supply and facilities as a result of lack of technical expertise and thus confidence in this area. We are, I believe, at the beginning of a rapid expansion of rural health care programmes. If they truly are, as they purport to be, "preventative" in orientation, then technical expertise in water and sanitation will have to be integrated into their activities and training programmes. Conversely, if the poorest and remoter villagers are going to benefit from the coming surge of emphasis on water, we will have to look to the emerging primary health care programmes as the most important mechanism of implementation.

Conclusions and Questions

In presenting this paper, I have tried to highlight some of the pitfalls and bottlenecks in delivering water to rural communities, in particular the impacts (or lack of them) of village water on disease, institutional and community involvement and participation problems and the valuable role which rural health care programmes could make but are not now effectively meeting the challenge. Having covered the "whys" and "whats", it is now time to turn to the "hows" and "wheres". I would like this meeting to address the problem of integrating water supply and sanitation into existing and future rural health care activities. This may not be as easy as it first appears. However, I am certain of one thing, if health care projects are willing to take up the challenge and modify their approaches then finances will soon follow - there should be no serious funding constraints.

There are almost as many approaches taken in rural health care programmes as there are countries and communities in which they work. Some are national in scope but barely reach the district clinic while others focus on smaller geographical areas and are more effective in reaching the village level. Some operate from within the Ministries of Health while others work quite separately from the government. All have roles to play, but which roles?

1. Integration of Rural Water and Sanitation in Health Care (HC) at the International Level

Few, if any UN agencies (including WHO), banks or donor organizations have succeeded in integrating water supply and sanitation into their HC activities. At the heart of the problem remains the disparities, lack of contact and even respect between the medical and engineering professions - this must be overcome, but HOW?

- What funds are and will be allocated to village water supplies and how can they be effectively channelled through to primary health care programmes? Certainly bank funds will not be available to HC for such purposes until these programmes can at least demonstrate capability in and commitment to this sector.
- What specific HC projects could be supported in this way and how might they act as examples for other programmes.

2. National Approaches to Implementing Water Supplies and Sanitation

There are numerous ways by which water sanitation facilities could be implemented but questions are raised as to which would be the most cost effective.

- Which type of personnel and administrative infrastructure are best suited to cope with delivery and maintenance of such technology in the village?
- Should control of surveys, design, standards, construction and maintenance be held at the central district or village levels?
- Who should be responsible for continued input to the village in terms of sanitary education: the village health leader, barefoot engineer, midwife, auxiliary, etc?
- Where should responsibility for maintenance and repair of the system be held?
- What sources of funds of construction and maintenance are relevant and in what amounts: international aid, national, village or perhaps user tariffs?

3. Manpower Development

Critical to the success of any activity in rural health care programmes is the training of relevant personnel. Technical competence needs to be integrated into the system at most levels; for example, the village worker will have to know the elements of hand-pump maintenance and to be able to recognize the tell-tale signs of surface water pollution; middle level workers will have to be able to inspect and oversee construction; technicians will need to be able to design reticulation systems; and physicians will want more practical experience to assist them in their supervisory roles.

- What kind of technical/engineering experience, competence and confidence need to be integrated into the system, to what degree and focusing on which personnel?

- Specifically, what courses and in-field experience are needed by the physicians, engineers, technicians, medical auxiliaries, sanitarians, nurses, midwives, medex personnel, health inspectors, village workers, and etc?
- What training mechanisms and aids are appropriate to which level of personnel?
- Which institutions and projects are relevant to begin this process of training and what teacher training requirements are there?

4. Relevant Technologies for Rural Water and Sanitation

A bewildering array of technologies are available for abstracting surface and ground water supplies, water transport, purification, excreta treatment and disposal, and etc. but:

- Which ones are relevant for use in the village?
- Which ones are compatible with technical capability in the village for maintenance and construction and which ones can be afforded by the people without external assistance?
- Where are the gaps in technology requiring further innovation and field testing?
- What design manuals are required and for which user?

5. Evaluation

There should be some kind of evaluative mechanism to provide pre- and post-project assessments. This would be not only to highlight successes and failures but also to provide insight into the cost-effectivenesses of the various approaches taken which will enable further adaptation and optimization.

- Who should carry out such evaluation, by what instruments and how?

- What mechanisms exist to ensure that such evaluations are coordinated to permit both within and between project comparisons.

These are just a few of the questions which I would like discussed in the group sessions which follow. The suggestions and conclusions arising out of this meeting will, I believe, provide focus and positive guidelines for a new and very significant combined initiative in primary health care and rural water programmes.

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